

Integrate



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Technology with Student Success

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As teaching methods and teaching tools evolve, so too should the way we use technology in the classroom.

The first blackboard was used in Philadelphia, Pennsylvania, in 1809 (Patten 2001). At that time, students were focused on what the teacher was doing in the front of the room. However, current classrooms focus on the learners. Technology can support such a learning environment. “As information technology continues to progress, teaching mathematic with multimedia is becoming a new way of instruction” (Najjar 2001). Tools such as interactive whiteboards, personal computers, and document cameras can help keep students’ interest high and vary the way the lesson is delivered.

According to Gardner’s theory of multiple intelligences, lessons should incorporate varied activities that engage all students. If lesson planning

accounts for different learning styles, students will be exposed to more than one type of learning, which increases the possibility of success and the desired outcomes (Gouws 2007). Integrating technology enables students to become more active in the learning process. When a student feels that he or she is more vested in actual learning, retention of the material tends to rise significantly.

Currently, the United States is statistically lagging behind other countries in mathematic achievement (Glod 2007). In fact, scores from the PISA test (Program for International Student Assessment) show that students in twenty-three other countries had higher mathematics scores than U.S. students (Glod 2007).

The challenge for educators is to enable our students to compete and succeed in today’s competitive global marketplace. The answer may lie within technology that your school district might have at its disposal. Technology can be leveraged to help teachers and students succeed.

INTERACTIVE WHITEBOARDS

The standard blackboard is being replaced in classrooms by interactive whiteboards. (Throughout this article, *whiteboards* refers to *interactive whiteboards*.) When used properly, this tool can help address all learning styles within a classroom. Research has shown that whiteboards have a positive impact on student motivation and engagement (Knight, Pennant, and

Piggott 2005). The versatility of the whiteboard encourages its use with all types of learners. Those with auditory challenges, specific learning disabilities, and autistic students have had success with this tool (Mechling, Gast, and Krupa 2007).

Various items can be used to control objects on the whiteboard screen as well as link it through a computer to the Internet. Therefore, a teacher can manipulate shapes and words to represent objects in real time. Lessons using the whiteboard can reach students who exhibit all learning styles, but lessons seem particularly effective for those who learn best using visualization and spatial reasoning.

Ratios and the Whiteboard

To teach a lesson on ratios, the instructor can project four blue marbles and three red marbles and explore a ratio by physically moving the marbles across the screen. After one or two examples, students can come to the board and visually manipulate the marbles on the screen to show any desired ratio. Thus, while taking control of the learning, they are also demonstrating their understanding. This process could be continued and repeated with shapes or could be changed to something different. Most important, each student in class would have an opportunity to interact with ratios in real time.

The whiteboard image library also houses a section dedicated to manipulatives, such as coins and money (Vassos 2004). The technology can be used to teach advanced material or something as basic as counting money.

Whiteboards can be used to feature software, do demonstrations, model processes, share learning experiences, guide discussion, or display independent work (Knight, Pennant, and Piggott 2004). Smith, Hardman, and Huggins (2006) explore dialogic teaching—the conversation between

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students and teachers—and found that whiteboards offer the capabilities of active teaching and learning.

Data and the Whiteboard

An instructor can use this technology to display a set of data using various graphs. To draw specific kinds of graphs, the background can be changed to graph paper (Gage 2002). The teacher can use any kind of data to represent a bar graph, a pie graph, a line graph, a stem-and-leaf plot, a box-and-whisker plot, and so on. Students can make these different graphs in real time using various colors. At the completion of the lesson, the teacher can show all the graphs or displays of data created that day.

Encourage students to compare and contrast similarities and differences. Then suggest that they reach their own conclusions and make any correlations that they find between the varying displays of data. The Internet can also be a ready source of graphs that contain different data sets.

Geometry and the Whiteboard

Shape differentiation can also be taught using this technology. Varying

types of triangles can be drawn on the board by hand or by using a whiteboard toolkit. Annotation tools allow a variety of shapes to be drawn (Gage 2002). Discussions can then highlight the differences among the shapes. Student volunteers could write their observations on the board and name the triangles appropriately (right, obtuse, acute, scalene, equilateral, or isosceles).

To extend this activity, each student could come up and draw his or her own triangle on the whiteboard. On the basis of one student's drawing, another student can write what type of triangle he or she thought the first student had drawn. Active participation by all students is encouraged and helps students think about the complexities of each different type of triangle.

Ball (2003) states that the whiteboard is bringing about changes in traditional teacher-pupil discourse. Communication and discussion among the fellow students also occurs naturally as many students begin to feel more comfortable with one another in this kind of learning environment. Like the teacher, students are now able to both ask questions and provide answers, thereby shifting some of the learning away from the teacher. This discovery approach allows each student to feel more connected and in tune with the learning.

DOCUMENT CAMERAS

Another tool that can aid students who learn best with spatial visualization is a document camera. This camera allows the teacher to show an object in real time as it is projected on a screen in full color and texture. All students are able to see even the smallest object clearly.

Discussing student work in the classroom becomes easier when a camera is used. For example, instead of a teacher reading or paraphrasing students' work during class, it

can be placed under the camera so all students can see, read, and visualize it. Again, the lesson becomes more meaningful to students because they are actively engaged.

The camera is also an excellent tool with which to share a single picture book. All students will be able to clearly see the pictures and the text while the teacher or a student reads aloud. It can be used in a variety of learning settings, such as to illustrate how to manipulate ratios, display three-dimensional objects, compare graphs, solve equations, and so on.

Many document cameras can also be set to take a snapshot after set intervals, which can show change over time within an experiment or sequencing activity. The snapshots can be viewed one at a time or all at once on one screen to see how the project has progressed. This interactive approach to learning will make the content seem more realistic to students.

COMPUTERS

A majority of students in the classroom have had experience with computers. If students are asked to do research on any given topic, the teacher should preselect Web sites that can be accessed. Information that students find can be presented to the class using a whiteboard or a document camera. Others may prefer producing a PowerPoint presentation to making a standard poster-board display. Glover and Miller (2001) found that students, particularly boys, relished making PowerPoint presentations to impress their peers. Offering students a variety of media in which to display their data will give the teacher an opportunity to better differentiate how students are learning.

Students should also be exposed to, and learn about, spreadsheets, such as the Excel program. It allows them to create basic formulas to calculate data that can then be

translated into a variety of spreadsheets or graphs. These, too, can be presented using the whiteboard, PowerPoint, a document camera, or other technology, thus making the student-based learning automatically interactive. Goodison (2002) suggests that whiteboards add a social dimension to learning because students share knowledge publicly and learn by making mistakes together. A student-centered classroom offers students the ability to explore and discover how to work with technology to make learning fun while also engaging with their peers.

PROS AND CONS OF WHITEBOARD TECHNOLOGY

Without a doubt, whiteboard technology has the ability to transform a bland classroom into a place where students want to learn. Interaction is the key, with students drawing, erasing, and producing large, colorful work (Miller 2003). In the context of technology use in the classroom, studies show that even teacher beliefs and attitudes influence teachers' use of computers in the classroom (Ertmer and Hruskocy 1999). There are, of course, other issues: The school must pay the start-up cost of the technology, and teachers must learn how to prepare materials and be willing to take some risks (Miller 2003). Although at times the individual teacher must take it on himself or herself to learn the technology, the opportunities for enhanced student engagement will make the initial work feel worth the effort.

The current economic climate may make you think that that new technology is unrealistic for your district. However, statistics show that the integration of new technology, especially whiteboards, is moving forward at a strong rate. Fortunately, more districts are scheduling professional development days as well as providing



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instructional technologists to support teachers and the use of technology in the classroom. Educational institutions, even when struggling financially, understand the need to push education into the future. An important aspect of our sociocultural theory is that all human action is mediated by tools (Armstrong et al. 2005). The technologies presented are tools, and the sooner we begin to integrate them and increase interactivity by using them, the more learning opportunities we provide for our students to succeed in school and in life.

THE TEACHER'S ROLE

Even though many reasons can be given to use whiteboards and other technologies in the classroom, many teachers feel threatened because they are unfamiliar with these tools. To integrate these items, districts must provide teachers with professional development. At a minimum, professional development should offer teachers a baseline of how to begin using these new products in the classroom. The skill of the teacher continues to be a key aspect of classroom interactivity (Jones 2004). It will take time for the

teacher to develop the skills, feel comfortable, and fully realize all the interactive features and capabilities that these new technologies can bring to the classroom. Teachers are the agents for this change in implementing much of these technologies into their subject matter and determining the quality of use (Armstrong et al. 2005).

Fortunately, many school districts are beginning to realize the importance of technology in the classroom and have hired fully trained technology directors and support staff. Their job is to collaborate with the teacher to integrate these technologies in the classroom. Research shows that the success of these technologies is based on teachers having long-term and daily access to the instruments as well as technical instructional support (Armstrong et al. 2005).

Technology will be more important than ever for the next generation of students. Their ability to gain functional arithmetic and technology skills could determine their level of success in the real world. As educators, we are preparing our students for an unknown new age. If students are exposed to challenging, exciting new tasks that embrace technology, we can encourage them to meet expectations. We must do our best to learn new cutting-edge delivery methods and procedures to give our students maximum opportunities.

BIBLIOGRAPHY

- Armstrong, Victoria, Sally Barnes, Rosamund Sutherland, Sarah Curran, Simon Mills, and I. Thompson. "Collaborative Research Methodology for Investigating Teaching and Learning: The Use of Interactive Whiteboard Technology." *Educational Review* 57 (2005): 457–69.
- Ball, Barbara. "Teaching and Learning Mathematics with an Interactive Whiteboard." *Micromath* 19 (2003): 4–7.
- Ertmer, Peggy A., and Carole Hruskocy. "Impacts of University/Elementary School Partnerships Designed to Support Technology Integration." *Educational Technology Research and Development* 47 (1999): 81–96.
- Gage, Jenny. "So What Is an Electronic Whiteboard? Should You Want One?" *Micromath* 18, no. 2 (Summer 2002): 5–7.
- Glod, Maria. "U.S. Teens Trail Peers around World on Math-Science Test." *Washington Post*, December 5, 2007. <http://www.washingtonpost.com/wp-dyn/content/article/2007/12/04/AR2007120400730.html>.
- Glover, Derek, and David Miller. "Running with Technology: The Pedagogic Impact of the Large-Scale Introduction of Interactive Whiteboards in One Secondary School." *Journal of Information Technology for Teacher Education* 10 (2001): 257–76.
- Goodison, Terry. "Enhancing Learning with ICT at Primary Level." *British Journal of Educational Technology* 33 (2002): 215–28.
- Gouws, F. W. "Teaching and Learning through Multiple Intelligences in the Outcomes-Based Education Classroom." *African Education Review* 4, no. 2 (2007): 60–74.
- Jones, Keith. "Using Interactive Whiteboards in the Teaching and Learning of Mathematics: A Research Bibliography." *Micromath* 20, no. 2 (Summer 2004): 5–6.
- Knight, Penny, Jennie Pennant, and Jennifer Piggott. "What Does It Mean to Use the Interactive Whiteboard in the Daily Mathematics Lesson?" *Micromath* 20, no. 2 (Summer 2004): 14–17.
- . "The Power of the Interactive Whiteboard." *Micromath* 21, no. 2 (Summer 2005): 11–15.
- Mechling, Linda C., David Gast, and Kristin Krupa. "Impact of SMART Board™ Technology: An Investigation of Sight Word Reading and Observational Learning." *Journal of Autism Developmental Disorders* 37 (2007): 1869–882.
- Miller, David. "The Interactive Whiteboard: A Revolution for Mathematics Teaching?" *Micromath* 19, no. 2 (Summer 2003): 17–18.
- Najjar, Lawrence J. "Principles of Educational Multimedia User Interface Design." In *Readings in Training and Simulation: A 30-Year Perspective*, pp. 146–58. Santa Monica, CA: Human Factors and Ergonomics Society, 2001.
- Patten, Sarah. "School: The Story of American Public Education." Stone Lantern Films and PBS. 2001. http://www.pbs.org/kcet/publicschool/about_the_series/index.html.
- Smith, F., F. Hardman, and S. Huggins. "The Impact of Interactive Whiteboards on Teacher-Pupil Interaction in the National Literacy and Numeracy Strategies." *British Educational Research Journal* 32, no. 3 (2006): 443–57.
- Vassos, K. "Classroom Instruction with Electronic Whiteboards." *Media & Methods* 41, no. 2 (September/October 2004): 20.
- Watson, Andy. "Interactive Whiteboard Market Shows No Real Signs of Recession." *Futuresource Consulting*. 2009. Retrieved June 11, 2009, from http://www.futuresource-consulting.com/press/2009_03_IWB_Update_release.pdf.

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